

BOTANY.—*Three new species of Muhlenbergia*.<sup>1</sup> CHARLOTTE O. GOODDING. (Communicated by JASON R. SWALLEN.)

During recent study of the specimens at the United States National Herbarium three new annual species of *Muhlenbergia* were found. One species occurs only in Arizona, the second in Arizona, New Mexico, Colorado, Texas, and Mexico, while the third is reported from Arizona and Mexico. Invaluable assistance in the determination of material and in the preparation of the manuscript was given by Jason R. Swallen.

***Muhlenbergia appressa* C. O. Goodding, sp. nov.**

Annual; culmi 10–40 cm longi, erecti vel decumbentes, ramosi, infra nodos scabri vel hispiduli; vaginae striatae, firmae, marginibus membranaceis, internodiis breviores; ligula 2–3 mm longa, hyalina, lacerata; laminae planae vel plicatae, 1–4 cm longae, 1–2 mm latae, scabrae vel pubescentes; paniculae 5–20 cm longae, 0.5–1 cm latae, saepe parte inferiore inclusa, ramis appressis paucifloris; spiculae 4.5–6 mm longae; glumae 1–2 mm longae, obtusae, integrae vel erosae; lemma 4.5–6 mm longum, scabrum, ad basim dense pilosum; arista 10–30 mm longa, scabra; palea acuminata, scabra, ad basim pilosa; granum fusiforme, 2.5 mm longum. Vaginae inferiores reductae, spiculis clandestinis; glumae obsoletae; lemma 3 mm longum, scabrum ad basim pilosum; arista 5 mm longa; granum 2 mm longum, ovatum.

Annual; culms erect to decumbent at the base, 10–40 cm long, much branched below, striate, scabrous to hispidulous below the nodes; sheaths shorter than the internodes, striate, scabrous, firm with membranaceous margins sometimes auricled; ligule thin, lacerate, decurrent, 2–3 mm long; blades flat or folded, scabrous or puberulent, 1–4 cm long, 1–2 mm wide; panicles numerous, as much as 20 cm long, 0.5–1 cm wide, green to purple, very narrow, few-flowered, often included at the base, the branches and pedicels closely appressed; spikelets slender, 4.5–6 mm long, the slender pedicels 0.5–4 mm long; glumes 1–2 mm long or sometimes less, obtuse, entire or erose, thin, pale, contrasting with the bright green scabrous nerve; lemma 4.5–6 mm long, 3-nerved, scabrous above, densely pilose on the callus and margins at the base; awn 10–30 mm long, slender, flexuous, scabrous; palea acuminate, scabrous, short pilose below; anthers 1.5–2 mm long, purplish; grain fusiform, about 2.5 mm long. Cleistogamous spikelets common in the lower reduced sheaths; glumes wanting; lemma about 3 mm long, sparsely scabrous above, pilose on the callus and margins at the base; awn about 5 mm long; grain 2 mm long, ovate.

This species is related to *M. microsperma* (DC.) Kunth, which differs in having a more open panicle with more densely flowered ascending to spreading branches, shorter ligule (1–2 mm long), and shorter lemma (2.5–3.5 mm long or rarely less).

*Type*.—Harrison & Kearney 1493 (U. S. National Herbarium no. 1296986), Devils Canyon, Pinal or Gila County, Ariz., March 28, 1926.

*Range*.—Canyons and slopes of southern Arizona.

*Specimens examined*.—Devils Canyon, Peebles, Harrison & Kearney 5085; mountains above Miami, L. N. Goodding in 1941; Camp Creek, Maricopa County, L. N. Goodding 23–41; Pima Canyon, Griffiths & Shear 2628.

<sup>1</sup> Received July 16, 1941.

**Muhlenbergia brevis** C. O. Goodding, sp. nov.

Annua; culmi graciles, erecti, 3–20 cm alti, caespitosi, ramosi, infra nodos scabri vel hispiduli; vaginae compressae, carinatae, striatae, firmae, marginibus membranaceis, internodiis longiores; ligula 1–3 mm longa, hyalina, lacerata; laminae planae vel involutae, 0.5–4 cm longae, 1–2 mm latae, supra scabrae vel pubescentes, infra scabrae; paniculae 1–12 cm longae, ca. 0.5 cm latae, saepe parte inferiore inclusa, ramis erectis usque ad 1 cm longis; spiculae 4–5 mm longae; glumae scabrae, quam flosculus breviores; gluma prima 1–3 mm longa, 2-nervia, minute vel profunde bifida; gluma secunda 1.5–4 mm longa, 1-nervia, acuminata vel setacea; lemma 4–5 mm longum, 3–5-nervium, scabrum, ad basim sparse pubescens; arista 10–20 mm longa, scabra; palea 4–5 mm longa, acuminata, scabra.

Annual; culms erect, 3–20 cm tall, slender, tufted, much branched below, scabrous to hispidulous below the nodes; sheaths compressed, keeled, striate, firm with membranaceous margins, usually longer than the internodes, the lower ones often spreading; ligule 1–3 mm (usually about 2 mm) long, thin, lacerate, often auriculate; blades flat to involute, 0.5–4 cm long (mostly 2–3 cm), 1–2 mm wide, scabrous or puberulent above, scabrous below, with white cartilaginous midrib and margins; panicles 1–12 cm long, less than 0.5 cm wide, often included at the base, rather densely flowered, pale green tinged with purple, the branches erect, as much as 1 cm long; spikelets slender, 4–5 mm long; glumes scabrous, variable, shorter than the floret; first glume 1–3 mm long, 2-nerved, minutely to deeply bifid, the slender teeth sometimes widely spreading; second glume 1.5–4 mm long (usually 2–3 mm), 1-nerved, narrow, acuminate to setaceous; lemma lanceolate, 4–5 mm long, prominently 3-nerved (rarely 5-nerved), scabrous especially on the nerves, sparsely to rather densely appressed pubescent between the nerves toward the base; awn 10–20 mm (rarely less) long, slightly flexuous, scabrous; palea 4–5 mm long, acuminate, scabrous; grain fusiform, 2.5 mm long.

This species is closely related to *M. depauperata* Scribn., which differs in having a shorter lemma (3–3.5 mm long) with a shorter awn (5–10 mm long or less) and glumes about as long as the floret.

*Type*.—*Metcalf* 671 (U. S. National Herbarium no. 495644), Mogollon Mountains, on Mogollon Creek, Socorro County, N. Mex., September 8, 1903.

*Range*.—Open ground at higher elevations, Colorado and Texas to Arizona, south to the Federal District, Mexico.

*Specimens examined*.—ARIZONA: Bowie, *Jones* in 1884. COLORADO: Rio Grande Forest, Conejos County, *Kutze* (U. S. Forest Service 66111). NEW MEXICO: Black Range, *L. N. Goodding* M-271, *L. N. & C. Goodding* M-377, *Metcalf* 1362; Datil National Forest, *Talbot* 47; Mimbres Mountains, *L. N. & C. Goodding* M-380 no locality given, *Wright* 2017. TEXAS: Mount Livermore, *Hinckley* 523. CHIHUAHUA: Sanchez, *Hitchcock* 7664. DURANGO: Sandia Station, *Pringle* 13634. SAN LUIS POTOSÍ: San Luis Potosí, *Schaffner* in 1877 and 1879. FEDERAL DISTRICT: Churubusco, *Orcutt* 4311.

**Muhlenbergia pectinata** C. O. Goodding, sp. nov.

Annua; culmi 10–25 cm longi, erecti vel decumbentes, ad nodos inferiores radicantes, ramosi, graciles, glabri vel infra nodos scabri; vaginae internodiis longiores, striatae, in ore plusminusve pilosae, saepe marginibus ciliatis; ligula hyalina, erosa vel ciliata, ca. 0.5 mm longa; laminae planae

vel involutae, pubescentes vel pilosae, 1–6 cm longae, 1–2 mm latae; paniculae 2–12 cm longae, ca. 0.5 cm latae, exsertae vel parte inferiore inclusa, ramis 0.5–4 cm longis, appressis, ad basim floriferis; spiculae 3.5–4.5 mm longae; glumae 1.5–3 mm longae, abrupte acutae vel acuminatae, aristatae; lemma 3–5 nervium, nervis lateralibus scabris vel ciliatis, callo pubescente; arista 10–30 mm longa, gracilis, flexuosa; palea acuminata lemma aequans.

Annual; culms 10–25 cm long, leafy, erect to decumbent, sometimes rooting at the lower nodes, slender to filiform, freely branching, glabrous to scabrous below the nodes, angular, usually square in cross section; sheaths commonly longer than the internodes, striate, more or less pilose at the throat, the margins often ciliate; ligule thin, erose to ciliate, about 0.5 mm long; blades flat to involute, divergent, pubescent to sparsely pilose, 1–6 cm long, 1–2 mm wide; panicles numerous, very narrow, exserted or more often included at the base, 2–12 cm. long, about 0.5 cm wide, the branches 0.5–4 cm long, appressed, floriferous from the base or nearly so; spikelets narrow, terete, 3.5–4.5 mm long; glumes equal or unequal, 1.5–2 mm or sometimes 3 mm long, prominently 1-nerved, scabrous on the nerve, abruptly acute or acuminate, commonly aristate, the awn usually about one-half the entire length; lemma prominently 3-nerved, with usually 2 intermediate nerves, scabrous to prominently ciliate on the lateral nerves, the callus appressed pubescent; awn 10–30 mm long, slender, flexuous; palea long-acuminate, as long as or slightly longer than the lemma.

This species is related to *M. ciliata* (H.B.K.) Kunth, which differs in having spreading panicle branches and shorter lemmas (2–2.5 mm long), shorter awns (3–12 mm long). It is also closely allied to *M. tenella* (H.B.K.) Trin., which differs in having smaller spikelets (2–2.5 mm long).

*Type*.—*Pringle 1745* (U. S. National Herbarium no. 995478), moist ledges of the barranca near Guadalajara, Jalisco, Mexico, November 1, 1888.

*Range*.—Moist rocky hillsides of southern Arizona, south to Jalisco, Mexico.

*Specimens examined*.—ARIZONA: Mule Mountains, Cochise County, *L. N. Goodding M-348*, *L. N. & C. Goodding M-406*; Sycamore Canyon, Santa Cruz County, *L. N. Goodding M-318*, *M-375*, *A-9386*. SONORA: Canyon de Huépari, north of Aribabi, *Harvey 1742*. CHIHUAHUA: Batopilas, *Palmer* in 1885. DURANGO: Vicinity of Durango, *Palmer 719* in 1896. JALISCO: Chapala, *Holway 3479*; Guadalajara, *Palmer 404* and *481* in 1886; Tequila, *Pringle 5395*; Zapotlan, *Hitchcock 7257*.

#### PALEOBOTANY.—*Pinus and Quercus in the Chesapeake Miocene*.<sup>1</sup>

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In 1936 I described a pine cone from the Calvert Cliffs Miocene under the name of *Pinus collinsi*,<sup>2</sup> naming it after the collector. Obviously the specimen furnished few features for a specific diagnosis, or for useful comparisons with other described species, either recent or fossil. I remarked on the apparent scarcity of land plants in these shallow-water marine sediments. In the past few years detailed examination of these strata by Dr. R. E. Lee Collins and by Dr. Charles T.

<sup>1</sup> Received June 30, 1940.

<sup>2</sup> *Torreyia* 36: 125, fig. 2. 1936.